

Renal artery aneurysm formation secondary to pseudoxanthoma elasticum

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This report describes a patient with pseudoxanthoma elasticum (PXE) who presented with an incidental finding of a renal artery aneurysm. PXE is a rare genetic condition. It is associated with calcification of elastin fibers and is characterized by skin, eye, and cardiovascular complications. Our patient was previously treated for retinal and gastrointestinal hemorrhage and coronary artery disease, and is under surveillance for cerebral aneurysms. Five reports in the published literature have described aneurysms in patients with PXE, but, to our knowledge, this is the first report of a patient with PXE and renal artery aneurysm. The literature on PXE and aneurysms is reviewed. (*J Vasc Surg* 2013;57:842-4.)

Pseudoxanthoma elasticum (PXE), also known as Gronblad-Strandberg syndrome, is a rare genetic condition, with a reported prevalence of one in 25,000.¹ It is inherited as an autosomal pseudodominant or a recessive variant and is associated with mutations of the adenosine triphosphate (ATP)-binding cassette transporter subfamily C member 6 (ABCC6) gene.² PXE is characterized by calcification and fragmentation of elastin fibers, which result in recognized multisystem complications affecting the skin, eyes, and cardiovascular system.¹ Commonly PXE begins with cutaneous lesions during childhood, mainly affecting the neck, the axillae, and the groin creases.² Angioid streaks in the retina, resulting from mineralization of elastin fibers, cause breaks in the Bruch membrane and predispose to retinal hemorrhages, with resulting loss of vision. Calcium deposits and eventual degeneration of elastin fibers in medium-sized vessels lead to accelerated atherosclerosis, particularly in the coronary arteries. Intermittent claudication and angina pectoris often develop by the third or fourth decade of life and may lead to myocardial infarction, congestive heart failure, and stroke.¹ Renal hypertension due to calcified renal arteries is a recognized complication characterized by dotted pattern hyperchogenicity on renal ultrasound.³

A 49-year-old woman presented to our vascular surgery unit with an asymptomatic left renal artery saccular aneurysm measuring 1.8 cm in maximal diameter. The aneurysm was diagnosed as an incidental finding on magnetic resonance angiography for chronic abdominal pain (*Fig 1*), probably secondary to renal calculi. The patient had normal renal function but was hypertensive and required dual antihypertensives.

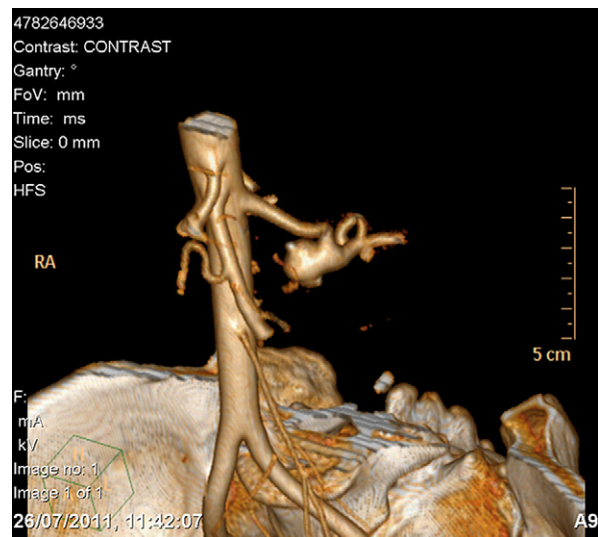


Fig 1. Magnetic resonance imaging reconstruction showing a saccular left renal artery aneurysm (maximum diameter, 1.8 cm) in a patient with pseudoxanthoma elasticum (PXE). RA, Right posterior-anterior.

Our patient was diagnosed with PXE at the age of 20, when she presented with a retinal hemorrhage and was found to have retinal angioid streaks. She had previously been treated for gastrointestinal hemorrhage. When she was in her mid-30s she had been admitted to the hospital with unstable angina and had undergone coronary artery bypass grafting for accelerated coronary artery atherosclerotic disease. She also has cerebral aneurysms in the posterior wall of the intracavernous right internal carotid artery that are currently under surveillance. She has two siblings, one of whom is also affected by PXE but to a much milder extent.

Over the previous 6 years, our patient had undergone abdominal imaging, including ultrasound scanning, computed tomography, and magnetic resonance angiography, when no renal artery aneurysm or renal vessel calcification was noted up to 4 years before her admission. There are

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Author conflict of interest: none.

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The editors and reviewers of this article have no relevant financial relationships to disclose per the JVS policy that requires reviewers to decline review of any manuscript for which they may have a conflict of interest.

0741-5214/\$36.00

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<http://dx.doi.org/10.1016/j.jvs.2012.09.016>

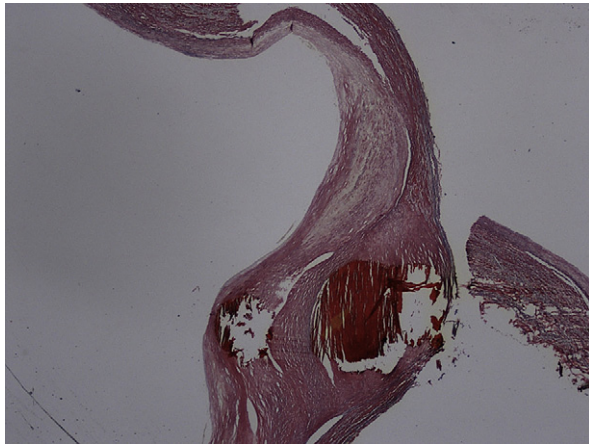


Fig 2. Low-power photograph of the aneurysm wall showing replacement of the normal structure by fibrosis and focal amorphous calcification (elastic van Gieson stain; original magnification, $\times 4$).

limited published data on the behavior of saccular aneurysms in patients with connective tissue disorders such as PXE, and there are no clear guidelines on the risk of aneurysm rupture in this patient group. In view of this background and in consultation with the patient, we opted to repair the aneurysm using an endovascular approach.

Our patient was admitted for elective left renal artery aneurysm repair using the Pipeline Embolization Device (eV3 Europe SAS, Paris, France) through an endovascular approach. However, the tortuosity of the renal artery at the aneurysm level led to failure of the stent opening at the proximal end. We then elected to remove the stent and repair the aneurysm surgically on an urgent basis via a left Kocher incision, excising the aneurysm with an end-to-end anastomosis of the native renal artery. Postoperatively, the patient had normal Doppler signals of her renal vessels, and her urine output and renal function were normal. The patient was discharged on the eighth postoperative day with normal renal function. At 5-week follow-up, renal artery Doppler examination revealed adequate perfusion of both kidneys with no renal artery stenosis. Magnetic resonance angiography at 4 months confirmed patent and nonstenosed renal vessels. The patient continues in follow-up with a number of different specialist teams for the chronic complications of PXE.

Histopathologic examination of sections stained with elastic van Gieson showed replacement of normal structure with fibrosis and focal amorphous calcification in the aneurysmal section (Fig 2). Both the internal and external elastic laminae were preserved in the nonaneurysmal artery wall. However, the elastic in the media was defective, being decreased compared with normal artery, and the elastic fibers present were disorganized (Fig 3), which is in keeping with expected histologic findings for PXE.

DISCUSSION

In the published literature to date, there are only five case reports of patients with PXE and aneurysms: two

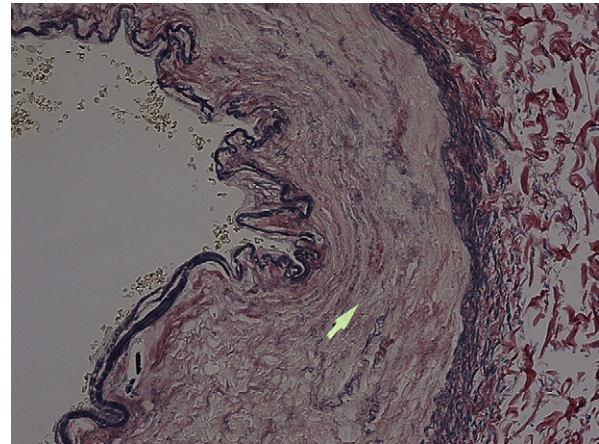


Fig 3. High-power photograph of the renal artery adjacent to the aneurysm showing preservation of both internal and external elastic laminae (black). However, between the two is a decreased number of elastic fibers in the media, and the elastic fibers are thin and disorganized (white arrow) (elastic van Gieson stain; original magnification, $\times 20$).

cranial aneurysms,^{4,5} two coronary,^{6,7} and one spinal artery.⁸ To our knowledge, this is the first case report of a renal artery aneurysm in a patient with PXE.

PXE is a rare genetic condition that affects the integrity of elastin in the skin, retina, and blood vessels, resulting in mineralization and degradation of elastin fibers. Aneurysm formation is associated with disruption of elastin and collagen fibers in blood vessel walls.⁹ Although currently there is no evidence confirming a causal relationship between PXE and aneurysm formation, an association between the two may be hypothesized given the known fragility of blood vessel walls in PXE⁹ and our histologic findings.

An association has been postulated between gastrointestinal hemorrhage, a common manifestation of PXE affecting about 10% of patients with the condition, and gastric vessel aneurysm formation and rupture.¹⁰ Our patient suffered from a gastrointestinal bleed 30 years ago, possibly due to an aneurysm of a gastric artery. However, we do not have access to her records from that admission to evaluate this possibility further.

Bendjelid et al⁷ reported the case of a patient with PXE, multiple coronary aneurysms, and aneurysmal dilatation of the aortic annulus. Their case may suggest that some variants of PXE are more prone to aneurysm formation, as in the case of our patient.

PXE is associated with mutations of the ABCC6 gene, of which >70 different mutations have been identified so far. The ABCC6 gene codes for a protein called multidrug resistance-associated protein 6 (MRP6). The exact role of MRP6 is unclear, but it is thought to be involved in mineralization of tissues providing strength and flexibility.¹¹ Interestingly, Schulz et al¹² reported five patients with ABCC6 mutations and abdominal aortic aneurysms, none with PXE.

In summary, this case report is the first to describe renal artery aneurysm in a patient with PXE and adds

further weight to the growing evidence supporting an association between PXE and aneurysm formation.

We would like to thank Dr Mary Sheppard at the Brompton Hospital (London) for her expertise and advice with the histopathology slides. We would also like to thank the patient for allowing us to use her case to highlight our findings.

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Submitted Jun 1, 2012; accepted Sep 18, 2012.